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CMMI Acquisition and Development Models (CMMI-ACQ/CMMI-DEV)
10 October 2006

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Capability Maturity Models - Overview

- A representation of the engineering and management “world”
- Focuses on elements of essential practices and processes from various bodies of knowledge
- Describes common sense, efficient, proven ways of doing business (which you should already be doing) - not a radical new approach
- Presents a minimum set of recommended practices and leverage points that have been shown to enhance organizational maturity and project capability
  - It defines the expectation (the “what”)
  - Without overly constraining the implementation (the “how”)
- Example implementations of CMMs:
  - People CMM: develop, motivate and retain project talent
  - Software CMM: enhance a software-focused development and maintenance capability
  - CMMI: focuses on systems and software engineering process development

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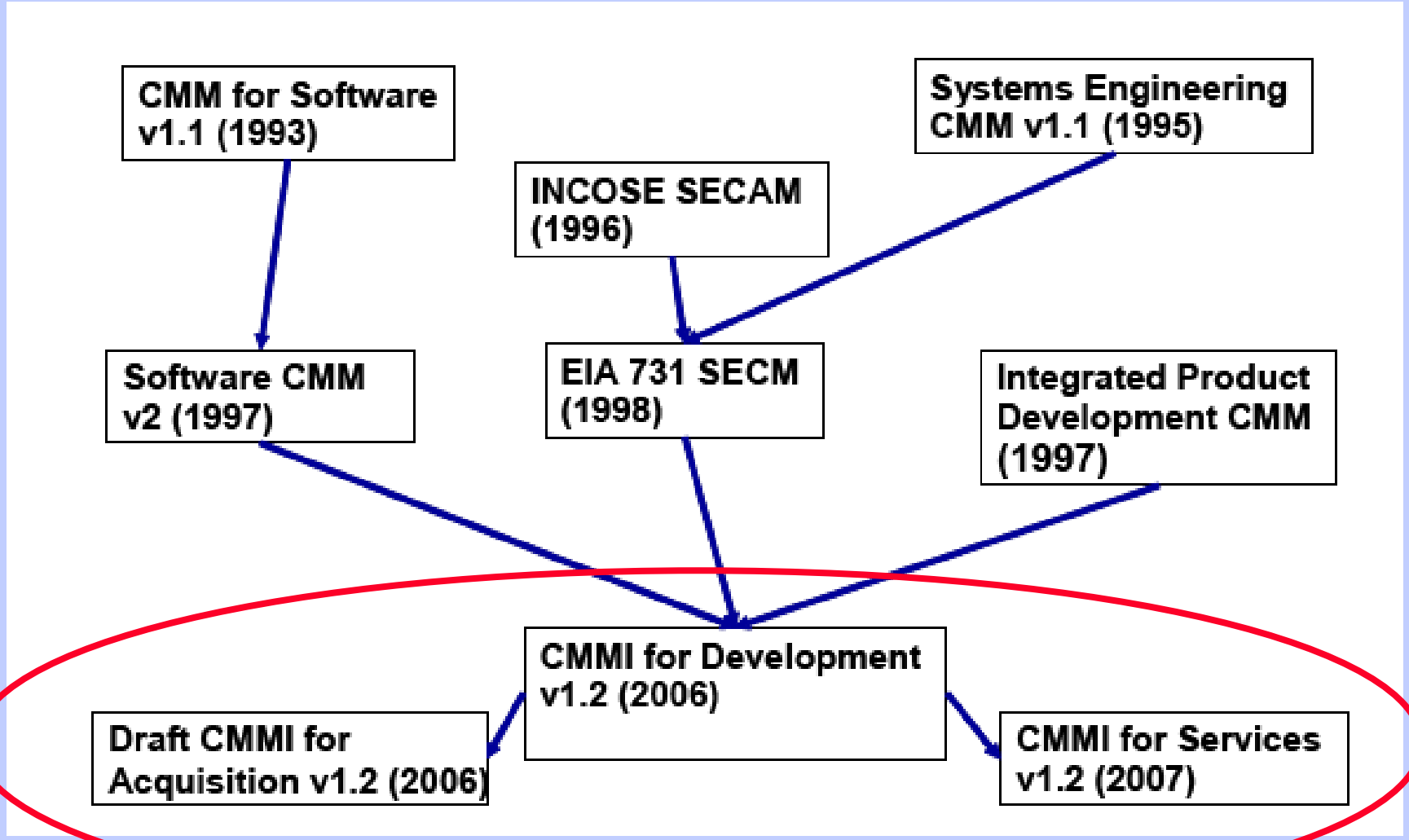
Who Needs CMMI?

CMMI

- CMMI is for projects or organizations that:
  - Need to manage the acquisition, development, and maintenance of products or services
  - Are concerned about cost and schedule overruns or unhappy users / stakeholders
  - Are concerned about costs of quality and rework
  - Are seeking a competitive advantage
- It is a process improvement method that provides a set of best practices to address productivity, performance, costs, and stakeholder satisfaction. CMMI focuses on the total system problem unlike:
  - Single-discipline models that can result in confusion and higher costs. CMMI facilitates enterprise-wide process improvement
  - Asynchronous initiatives that result in bolt-ons that last only as long as the squeaking.
    - » CMMI provides a consistent, enduring framework that can accommodate new initiatives
    - » CMMI integrates well with current best practices, process improvement, or quality management strategies (ISO-9001, PMBOK, Lean Six Sigma, etc.)

History/Relationship of CMMI Models


CMM for Software v1.1 (1993)
Systems Engineering CMM v1.1 (1995)
INCOSE SECAM (1996)
Software CMM v2 (1997)
EIA 731 SECM (1998)
Integrated Product Development CMM (1997)
CMMI for Development v1.2 (2006)
Draft CMMI for Acquisition v1.2 (2006)
CMMI for Services v1.2 (2007)

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Capability Maturity Model Integration - Current

- Multiple models, based on disciplines addressed
  - CMMI - ACQ: Acquisition
  - CMMI - DEV: Systems Engineering
  - CMMI - SVC: Technical Support Services
- CMMI V1.2 incorporates lessons learned from using other standards and models (Software CMM, EIA-731, IEEE-12207)
- Developed at the DoD-sponsored Software Engineering Institute (SEI)
  - CMMI-ACQ in draft, expect release in 2007
  - CMMI-SVC in development, expect release in 2007
  - Models and information at http://www.sei.cmu.edu/cmmi/

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CMMI For Acquisition Organizations (CMMI-ACQ)

- CMMI-ACQ is being developed as a joint effort between General Motors and the Software Engineering Institute
- Provides process improvement guidance for organizations engaged in acquisition
- "Adopting CMMI for Acquisition Organizations: A Preliminary Report" published in June 2006
  - Contains the draft CMMI-ACQ model
- Model will be piloted and further developed before official acceptance by Government and industry
- Based on CMMI V1.2 architecture and model framework
- SEI developing CMMI V1.2 for Acquisition Organizations, Development Organizations, and Services Organizations

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CMMI-ACQ Process Areas
(22 process areas)

- Acquisition Management (AM)
- Acquisition Requirement Development (ARD)
- Acquisition Technical Solution (ATS)
- Acquisition Validation (AVAL)
- Acquisition Verification (AVER)
- Causal Analysis and Resolution (CAR)
- Configuration Management (CM)
- Decision Analysis and Resolution (DAR)
- Integrated Project Management (IPM)
- Measurement and Analysis (MA)
- Organization Innovation and Deployment (OID)
- Organization Process Definition (OPD)
- Organization Process Focus (OPF)
- Organization Process Performance (OPP)
- Organizational Training (OT)
- Project Monitoring and Control (PMC)
- Project Planning (PP)
- Process and Product Quality Assurance (PPQA)
- Quantitative Project Management (QPM)
- Requirement Management (RM)
- Risk Management (RSKM)
- Solicitation and Supplier Agreement Development (SSAD)

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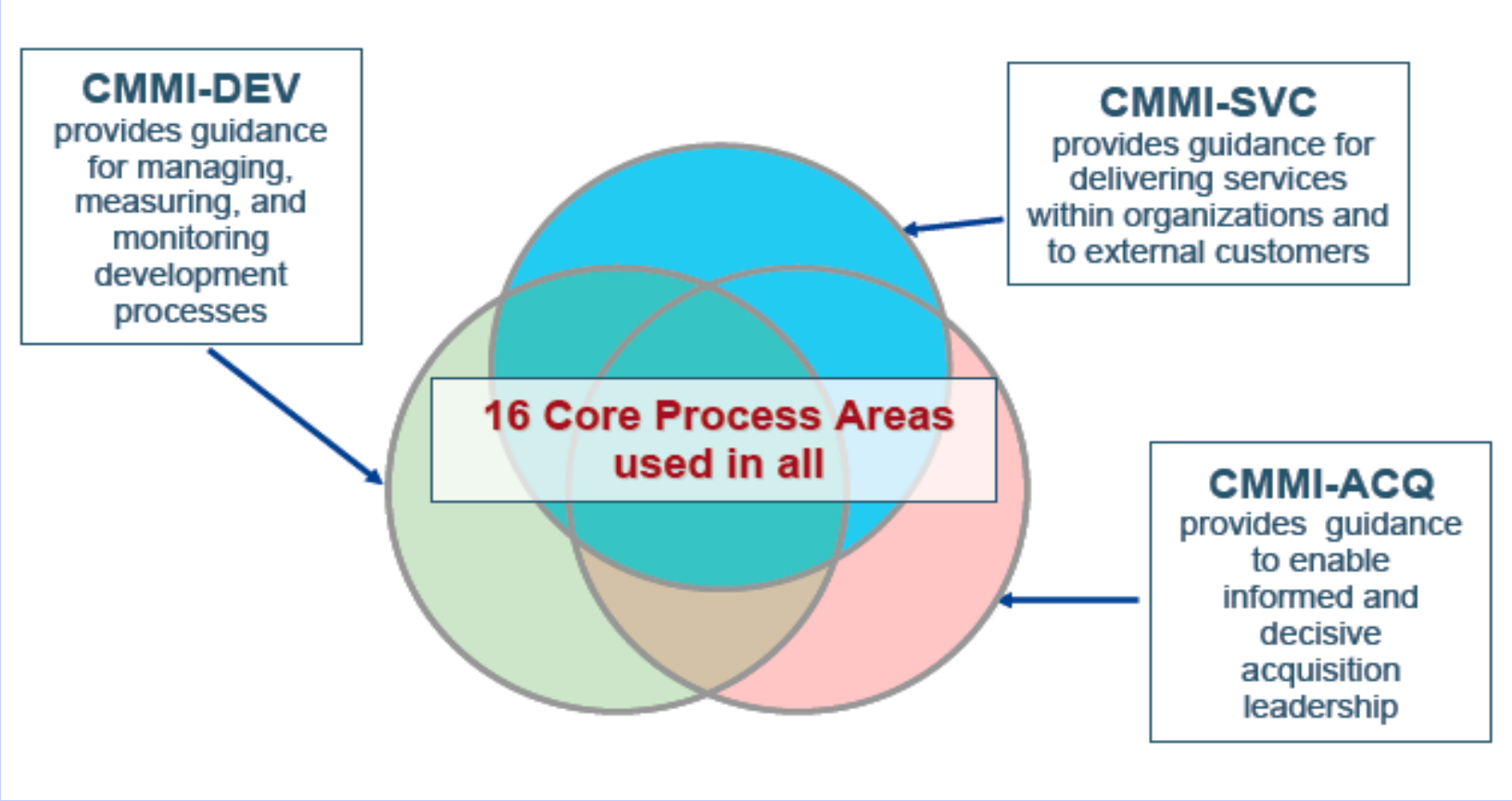
CMMI-DEV Process Areas
(22 process areas)

- Causal Analysis and Resolution (CAR)
- Configuration Management (CM)
- Decision Analysis and Resolution (DAR)
- Integrated Project Management + Integrated Process and Product Development (IPM + IPPD)
- Measurement and Analysis (MA)
- Organization Innovation and Deployment (OID)
- Organization Process Definition + IPPD (OPD + IPPD)
- Organization Process Focus (OPF)
- Organization Process Performance (OPP)
- Organizational Training (OT)
- Product Integration (PI)
- Project Monitoring and Control (PMC)
- Project Planning (PP)
- Process and Product Quality Assurance (PPQA)
- Quantitative Project Management (QPM)
- Requirements Development (RD)
- Requirement Management (RM)
- Risk Management (RSKM)
- Supplier Agreement Management (SAM)
- Technical Solution (TS)
- Validation (VAL)
- Verification (VER)

MUTUALLY SUPPORTIVE CMMI MODELS


CMMI-DEV
provides guidance for managing, measuring, and monitoring development processes
CMMI-SVC
provides guidance for delivering services within organizations and to external customers
16 Core Process Areas used in all
CMMI-ACQ
provides guidance to enable informed and decisive acquisition leadership

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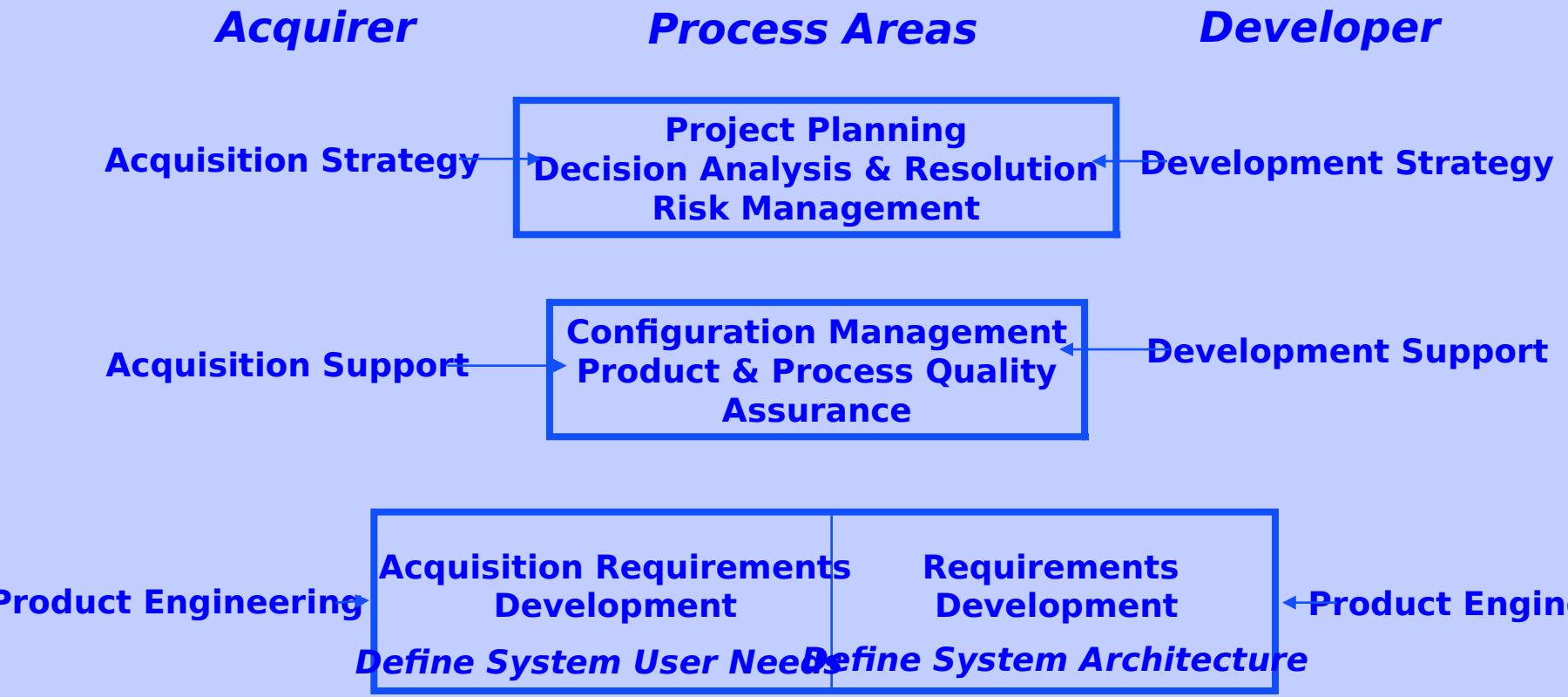
CMMI-ACQ Complements CMMI-DEV



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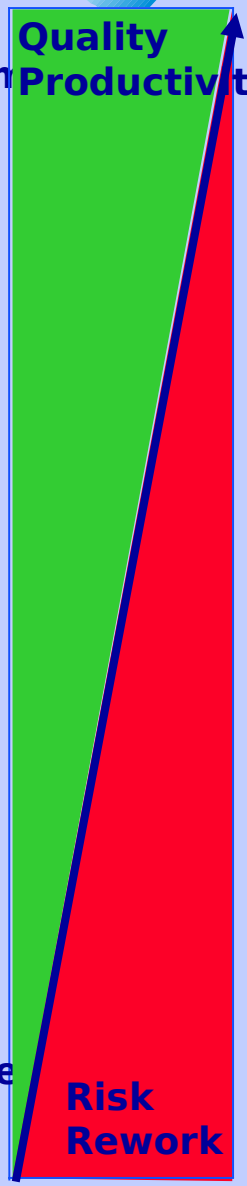
CMMI DEV Staged Representation

Level	Focus	Process Areas
5 Optimizing	*Continuous Process Improvement*	Organizational Innovation and Deployment Causal Analysis and Resolution
4 Quantitatively Managed	*Quantitative Management*	Organizational Process Performance Quantitative Project Management
3 Defined	*Process Standardization*	Requirements Development Technical Solution Product Integration Verification Validation Organizational Process Focus Organizational Process Definition (+ IPPD extras) Organizational Training Integrated Project Mgmt (+ IPPD extras) Risk Management Decision Analysis and Resolution
2 Managed	*Basic Project Management*	Requirements Management Project Planning Project Monitoring and Control Supplier Agreement Management Measurement and Analysis Process and Product Quality Assurance Configuration Management
1 Initial		



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Level 1: the “Initial” Level
Success depends on heroes

Good performance is possible - but

- **Requirements often misunderstood, uncontrolled**
- **Schedules and budgets frequently missed**
- **Progress not measured**
- **Product content not tracked or controlled**
- **Engineering activities nonstandard, inconsistent**
- **Teams not coordinated, not trained**
- **Defects proliferate**

“Schedules run everything”

“Just send in the Tiger Team”

“Processes limit my creativity”

“Processes don’t help my delivery schedule”

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CMMI Level 2: the "Managed" Level - Establishing basic project management controls

DETERMINE REQUIREMENTS

- Baseline the product requirements

DOCUMENT PLANS

- Estimate project parameters,
- Develop plans and processes

TRACK PROGRESS

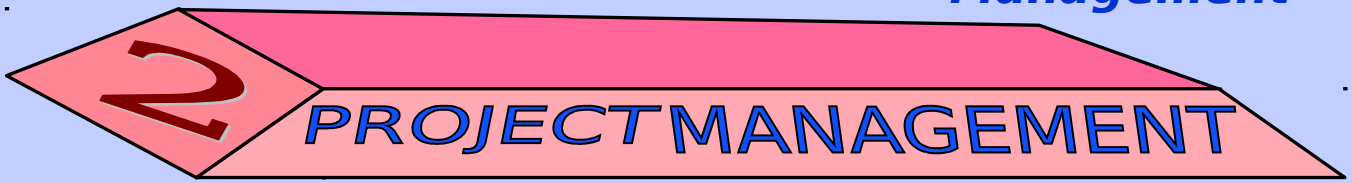
- Measure actual progress to enable timely corrective action
- Measure for mgmt. info needs
- Verify adherence of processes and products to requirements

CONTROL PRODUCTS

- Identify and control products, changes, problem reports
- Select qualified suppliers / vendors; manage their activities

7 Process Areas

- *Requirements Management (REQM)*
- *Project Planning (PP)*
- *Project Monitoring and Control (PMC)*
- *Measurement & Analysis (M&A)*
- *Process & Product Quality Assurance (PPQA)*
- *Configuration Management (CM)*
- *Supplier Agreement Management (SAM)*



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CMMI Level 3: the "Defined" Level - Standardizing the organization's process

ENGINEER THE PRODUCT

- Clarify customer requirements
- Solve design requirements; develop implementation processes
- Assemble product components, deliver
- Ensure products meet requirements
- Ensure products fulfill intended use
- Analyze decisions systematically

MANAGE THE PROJECT

- Follow integrated, defined processes
- Identify and control potential problems

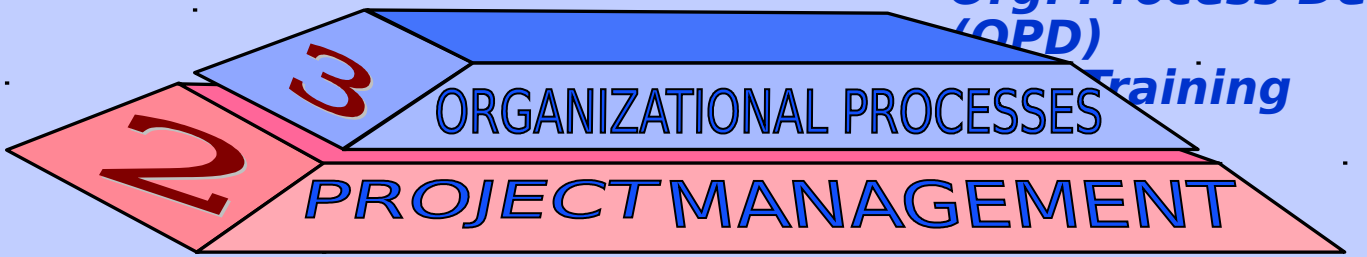
PROVIDE ORG. INFRASTRUCTURE

- Establish org. responsibility for PI
- Define the org's best practices
- Develop skills and knowledge

11 Process Areas*

- ***Requirements Developmt (RD)***
- ***Technical Solution (TS)***
- ***Product Integration (PI)***
- ***Verification (Ver)***
- ***Validation (Val)***
- ***Decision Analysis & Resolution (DAR)***
- ***Integrated Project Mgmt (IPM)***
- ***Risk Management (RSKM)***
- ***Org. Process Focus (OPF)***
- ***Org. Process Definition (OPD)***
- ***Training (OT)***

*SE/SW model



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CMMI Higher Maturity Level Concepts

OPTIMIZE PERFORMANCE
- Identify and eliminate the cause of defects early

ADOPT IMPROVEMENTS
- Identify and deploy new tools and process improvements to meet needs and business objectives

MANAGE PROJECTS QUANTITATIVELY
- Statistically manage the project's processes and sub-processes

MANAGE THE ORGANIZATION QUANTITATIVELY
- Understand process performance to quantitatively manage the organization's projects

Level 5 Process Areas

- *Causal Analysis and Resolution (CAR)*
- *Organizational Innovation and Deployment (OID)*

Level 4 Process Areas

- *Quantitative Project Management (QPM)*
- *Organizational Process Performance (OPP)*

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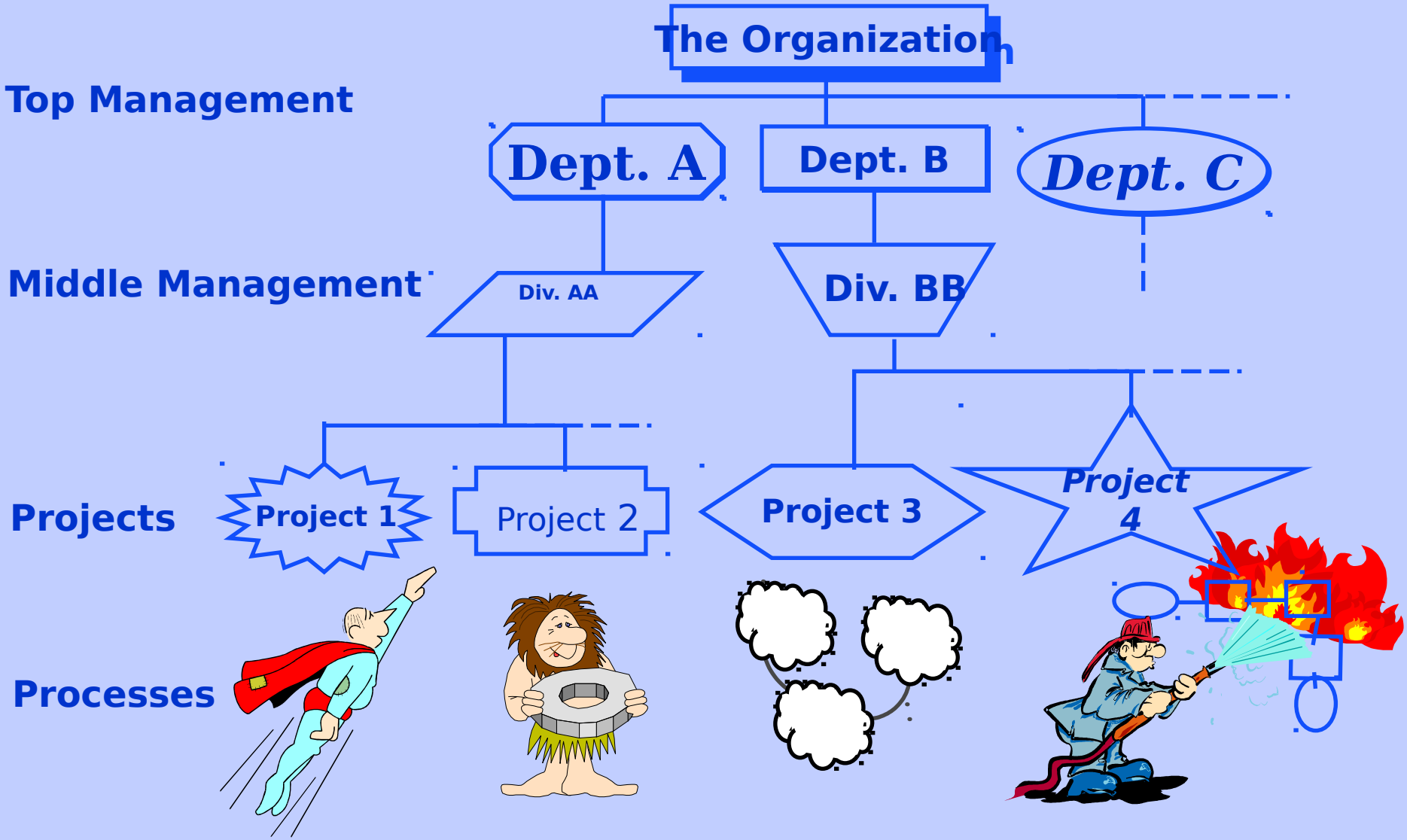
Sample Level 1 Organization

few processes in place



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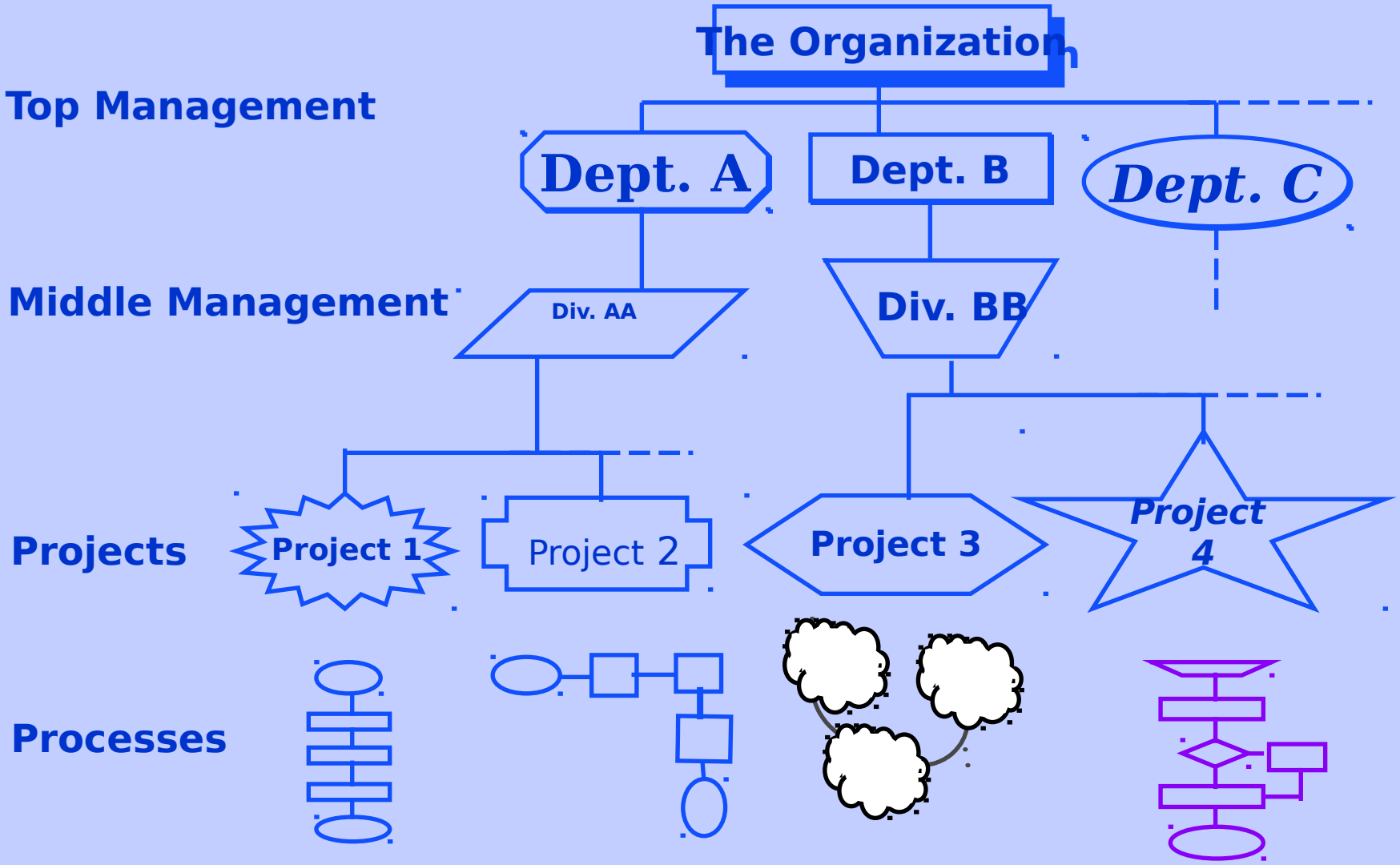
Sample Level 2 Organization

many processes in place; but they are project-specific



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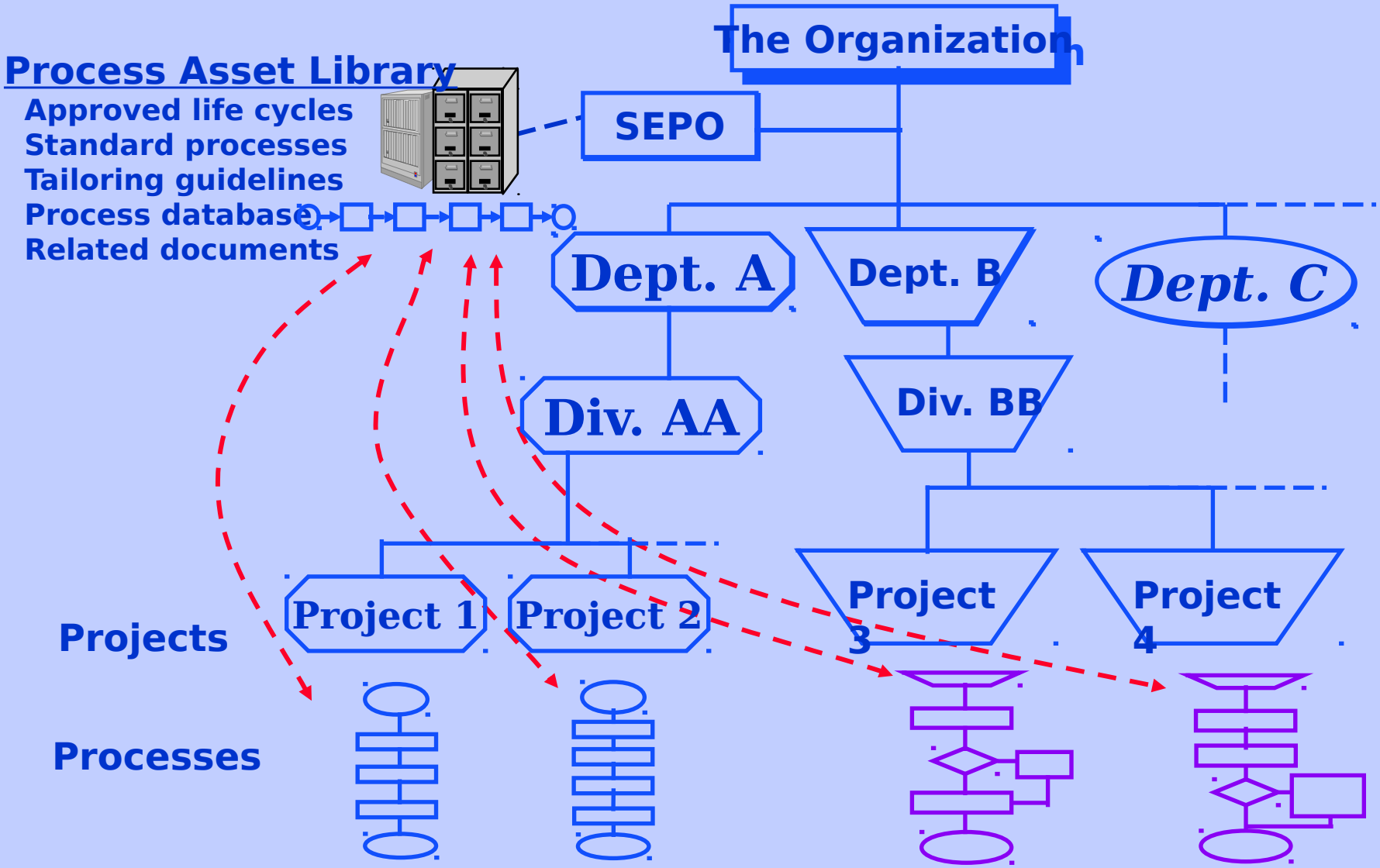
Sample Level 3 Organization

processes based on organization's Process Asset Library (PAL)



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Implementation Strategies at SSC San Diego

- **Project Management Guide** (Center wide implementation)
  - Based on the Project Management Body of Knowledge from the Project Mgmt Institute
  - Establishes core Project Mgmt competencies as a basis for sound Project Mgmt, and a springboard for further process improvement (CMMI)
- **Lean Six Sigma** (Center wide implementation)
  - Integrates Lean Manufacturing with Six Sigma statistical process control
  - Provides a mechanism for implementing process improvement to eliminate waste and maximize performance
- **Top Ten Best Practices** (Codes 240 and 270)
  - Based upon the CMMI
  - Identifies best practices that are deemed essential for implementation within the organization (department)

THESE PROCESS IMPROVEMENT INITIATIVES ARE COMPLEMENTARY, AND DO NOT CONFLICT

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Summary

- CMMI-ACQ is being piloted
- Complements Developer CMMI (CMMI-DEV v1.2) which has been released
- Follows the CMMI architecture
- Process Areas very similar to CMMI SW/SE with emphasis on the acquirers role
- Can be adopted by acquisition commands (SPAWAR, NAVAIR, NAVSEA)